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10/073,293	02/13/2002	Ekaterina Alexsandrovna Tabolina	US-1450	3493

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EXAMINER	
GANGLE, BRIAN J	
ART UNIT	**PAPER NUMBER**
1645	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/073,293	TABOLINA ET AL.	
	Examiner	Art Unit	
	Brian J. Gangle	1645	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-30,32 and 33* is/are pending in the application.

4a) Of the above claim(s) *4-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3,32,33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/15/2007 has been entered.

The amendment and remarks, filed 3/15/2007, are acknowledged. Claims 1, 3, and 32-33 are amended. Claims 2 and 31 are cancelled. Claims 1, 3-30 and 32-33 are pending. Claims 4-30 are withdrawn as being drawn to non-elected inventions. Claims 1, 3, and 32-33 are currently under examination.

Objections Withdrawn

The objection to the specification because it contains an embedded hyperlink is withdrawn in light of applicant's amendment thereto.

The objection to claim 1 because section (B) of the claim reads "1 to 12 amino acids in the amino acid sequence in SEQ ID NO:4, and and wherein said protein" is withdrawn in light of applicant's amendment thereto.

Claim Rejections Withdrawn

35 USC § 112 – New Matter

The rejection of claims 1-3 and 31-33 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement for the inclusion of new matter, is withdrawn in light of applicant's amendment thereto.

35 USC § 112 – Enablement

The rejection of claims 1-3, 31, and 33, under 35 U.S.C. 112, first paragraph because the specification does not enable any person skilled in the art to which it pertains, or with which it is

most nearly connected, to make and use the invention commensurate in scope with these claims, is withdrawn in lieu of the rejection set forth below.

35 USC § 112 – Second paragraph

The rejection of claim 1 as being rendered vague and indefinite by the phrase "increasing the activities of a protein," is withdrawn in light of applicant's amendment thereto.

The rejection of claim 1 as being rendered vague and indefinite by the phrase "or its analogs to the bacterium," is withdrawn in light of applicant's amendment thereto.

The rejection of claim 2 for a lack of antecedent basis is withdrawn in light of the cancellation of the claim.

The rejection of claim 31 as being rendered vague and indefinite by the phrase "wherein the number of deletion, substitution, insertion or addition of amino acids in the amino acid sequences in SEQ ID NOS:4 and 6 is 1-5," is withdrawn in light of the cancellation of the claim.

The rejection of claim 32 as being rendered vague and indefinite because the claim is dependent upon claim 31, is withdrawn in light of applicant's amendment thereto.

The rejection of claim 33 as being rendered vague and indefinite because the claim is dependent upon claim 32, is withdrawn in light of applicant's amendment thereto.

35 USC § 102

The rejection of claims 1-2 and 31-33 under 35 U.S.C. 102(b) as being anticipated by Furukawa *et al.* (US Patent 4,996,147, 1991), is withdrawn in light of applicant's amendment thereto.

The rejection of claims 1-3 and 31-33 under 35 U.S.C. 102(b) as being anticipated by Sano *et al.* (European Patent Application Publication 0 643 135 A1, 1995) is withdrawn in light of applicant's amendment thereto.

New Claim Rejections

35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 3, 32, and 33 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant is directed to the Guidelines for the Examination of Patent Applications Under the 35 U.S.C. 112, first paragraph "Written Description" Requirement, Federal Register, Vol. 66, No. 4, pages 1099-1111, Friday January 5, 2001.

The instant claims are drawn to bacteria where the expression of protein A or B and the expression of protein C or D is increased. Proteins A and C comprise the sequences of SEQ ID NO:4 and 6, respectively, while proteins B and D have "deletions, substitutions, insertions, or additions of 1 to 5 amino acids, and wherein said protein imparts to the bacterium enhanced resistance to L-amino acids." Any combination of A or C and B or D is encompassed by the claims. Additional dependent claims are drawn to the bacterium where proteins B and D are encoded by the polynucleotide which hybridizes with the sequence complementary to the nucleotide sequence of SEQ ID NO:3 (for protein B) and SEQ ID NO:5 (for protein D), under conditions comprising washing in 1x SSC and 0.1% SDS at 60°C.

The specification discloses proteins with the sequence of SEQ ID NO:4 and 6, which meet the written description provision of 35 USC 112, first paragraph. However, the aforementioned claims encompass a phenomenally large genus of proteins, which combined, encompass an even larger genus of bacteria. As the activity of both proteins is unknown, applicant has not demonstrated any link between the structure and the function of the claimed proteins. Applicant has previously argued that a variation of 1 to 5 amino acids is a small variation. However, the claims are not limited to a variation of only 1 to 5 amino acids. The

claims encompass an unlimited number of changes, where each change is a deletion, substitution, insertion, or addition of 1 to 5 amino acids.

The specification provides no guidance regarding which of these variants is capable of the required function. Therefore, the specification provides insufficient written description to support the genus encompassed by the claim. Vas-Cath Inc. v. Mahurkar, 19 USPQ2d 1111, makes clear that

"applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention. The invention is, for purposes of the 'written description' inquiry, whatever is now claimed." (See page 1117.) The specification does not "clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." (See Vas-Cath at page 1116.)

With the exception of SEQ ID NO:4 and 6, the skilled artisan cannot envision the detailed chemical structure of the encompassed polypeptides that correlates to the claimed function, regardless of the complexity or simplicity of the method of isolation. Adequate written description requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it. The nucleic acid and/or protein itself is required. See Fiers v. Revel, 25 USPQ2d 1601, 1606 (CAFC 1993) and Amgen Inc. V. Chugai Pharmaceutical Co. Ltd., 18 USPQ2d 1016. In Fiddes v. Baird, 30 USPQ2d 1481, 1483, claims directed to mammalian FGF's were found unpatentable due to lack of written description for the broad class. The specification provided only the bovine sequence.

Finally, University of California v. Eli Lilly and Co., 43 USPQ2d 1398, 1404. 1405 held that:

...To fulfill the written description requirement, a patent specification must describe an invention and does so in sufficient detail that one skilled in the art can clearly conclude that "the inventor invented the claimed invention." Lockwood v. American Airlines Inc. , 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (1997); In re Gosteli , 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989) (" [T]he description must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed."). Thus, an applicant complies with the written description requirement "by describing the invention, with all its claimed limitations, not that which makes it obvious," and by using "such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention." Lockwood, 107 F.3d at 1572, 41 USPQ2datl966.

Therefore, only the bacterium with increased expression of SEQ ID NO:4 and SEQ ID NO:6, but not the full breadth of the claims, meet the written description provision of 35 USC 112, first paragraph. The species specifically disclosed are not representative of the genus because the genus is highly variant. Applicant is reminded that Vas-Cath makes clear that the written description provision of 35 USC 112 is severable from its enablement provision. (See page 1115).

Claims 1, 3, 32, and 33 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for isolated L-amino acid production bacteria belonging to the genus *Escherichia*, wherein the bacterium has increased expression of a protein comprising the amino acid sequence of SEQ ID NO:4 and which has increased expression of a protein comprising the amino acid sequence of SEQ ID NO:6, does not reasonably provide enablement for the claims as drawn. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims.

Enablement is considered in view of the Wands factors (MPEP 2164.01(A)). These include: nature of the invention, breadth of the claims, guidance of the specification, the existence of working examples, state of the art, predictability of the art and the amount of experimentation necessary.

In re Fisher, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970) states, "The amount of guidance or direction needed to enable the invention is inversely related to the amount of knowledge in the state of the art as well as the predictability in the art." "The "amount of guidance or direction" refers to that information in the application, as originally filed, that teaches exactly how to make or use the invention. The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention, and the more predictable the art is, the less information needs to be explicitly stated in the specification. In contrast, if little is known in the prior art about the nature of the invention and the art is unpredictable, the specification would need more detail as to how to make and use the invention in order to be enabling" (MPEP 2164.03). The MPEP further states that physiological activity can be considered inherently unpredictable. Thus, Applicant assumes a certain burden in establishing

that inventions involving physiological activity are enabled. All of the Wands factors have been considered with regard to the instant claims, with the most relevant factors discussed below.

Nature of the invention: The instant claims are drawn to bacteria where the expression of protein A or B and the expression of protein C or D is increased. Proteins A and C comprise the sequences of SEQ ID NO:4 and 6, respectively, while proteins B and D have "deletions, substitutions, insertions, or additions of 1 to 5 amino acids, and wherein said protein imparts to the bacterium enhanced resistance to L-amino acids." Any combination of A or C and B or D is encompassed by the claims. Additional dependent claims are drawn to the bacterium where proteins B and D are encoded by the polynucleotide which hybridizes with the sequence complementary to the nucleotide sequence of SEQ ID NO:3 (for protein B) and SEQ ID NO:5 (for protein D), under conditions comprising washing in 1x SSC and 0.1% SDS at 60°C.

Breadth of the claims: The claims encompass all bacteria in the genus *Escherichia* that produce any L-amino acids (it is noted that all bacteria produce L-amino acids) wherein said bacteria has increased expression of proteins with an unlimited number of mutations, where each mutation is a deletion, substitution, insertion, or addition of 1 to 5 amino acids, so long as the protein imparts increased resistance to L-amino acids. This includes practically any protein that enhances bacterial resistance to L-amino acids. The claim does not require the bacteria to have enhanced L-amino acid production; however, this is the only disclosed utility of the claimed bacteria.

Guidance of the specification/The existence of working examples: The specification discloses a bacterium that has been transformed by a plasmid bearing the nucleic acid encoding SEQ IDs 4 and 6. The specification further teaches that, under appropriate conditions, said bacterium is capable of producing increased levels of threonine, valine, proline, leucine, and methionine. The specification lacks any teaching of a protein which comprises an amino acid sequence including deletion, substitution, insertion, or addition of any amino acids in the amino acid sequence of SEQ ID NO: 4 or 6, which has an activity of making bacterium having enhanced resistance to L-amino acids and/or its analogs; or that said proteins would cause enhanced amino acid production. There is no guidance in the specification regarding which amino acids can be deleted, substituted, inserted, or added while retaining activity. The specification further lacks any teaching that a protein comprising either SEQ ID 4 or 6 by itself

would lead to enhanced amino acid production, or that the combination would lead to enhanced production of amino acids other than threonine, valine, proline, leucine, and methionine. Besides the amino acid sequences of SEQ IDs 4 and 6, the only information the specification gives on the two proteins is that they are putative transmembrane proteins with unknown function. The specification suggests that they might be membrane proteins with L-amino acid excretion activity (p. 3, lines 11-26), but offers no evidence of this and no information on the regulation of these proteins, and offers no means of determining what the activity of said proteins is.

State of the art: The art is very limited with regard to said proteins. The nucleic acid sequences encoding both SEQ ID 4 and SEQ ID 6 were disclosed in Blattner *et al.* (IDS filed 6/17/2002, document AW) as putative proteins. There is no information in the art regarding the function, or regulation of these proteins. The nucleic acid sequences that comprises regulatory sequences or the proteins that act as promoters or repressors of said proteins are completely unknown. The art does show that mature biologically active forms of many proteins are post-translationally modified by glycosylation, phosphorylation, prenylation, acylation, ubiquitination or one or more of many other modifications and many proteins are only functional if specifically associated or complexed with other molecules including DNA, RNA, proteins and organic and inorganic cofactors. The type of protein modification and the sites modified at a specific cellular state can usually not be determined from the gene sequence alone (Haynes *et al.*, Electrophoresis, 19:1862-1871, 1998, see p. 1863, paragraph bridging cols. 1-2). In addition, Skolnick *et al.* (Trends in Biotech., 18:34-39, 2000) state that sequence-based approaches to function prediction fails to take into account the powerful three-dimensional information displayed by protein structures (p. 34, col. 2, paragraph 4), and that even when the structure is determined, "knowing the protein structure by itself is insufficient to annotate a number of functional classes and is also insufficient for annotating the specific details of protein function" (p. 35, box 2). The art further shows that the alteration of even a single amino acid can change the activity of a protein. In the case of Sickle-cell anemia, a change of one amino acid from glutamate to valine leads to deformed erythrocytes (Voet *et al.*, Biochemistry, 2nd ed., John Wiley and Sons, Inc, 1995, p. 124). Similarly, in the case of antigen-antibody interaction, McGuinness *et al.* (*Lancet* 337: 514-517, March 1991) taught that a point mutation generating a single amino acid change in a P1.16-specific epitope in the VR2 region of the *porA* gene of a

strain of *Neisseria meningitidis* of subtype P1.7,16 resulted in "striking changes in the structural and immunological properties of the class 1 protein" of this isolate (see abstract and page 514). Thus, the alteration of even a single amino acid can lead to substantial changes in a protein, which might or might not enhance the activity of the protein. Claim 1 requires that activity of protein C or D be enhanced. However, there is no means provided in the specification to quantify the activity of said proteins. Without knowing the function of said proteins, one would not know how to assay the activity of said proteins. Moreover, the regulation of protein expression is a complex process that is completely undescribed regarding the putative proteins of the instant invention. There is no description of the structure or activity of the promoter necessary for transcription or whether there is a repressor, inducer, or sigma factor involved. There is no information in the art regarding whether the regulation of these proteins is cis-acting or trans-acting or whether the genes are under positive or negative control.

Therefore, in view of the lack of support in the art and specification, it would require undue experimentation on the part of the skilled artisan to make and use the bacteria as claimed; therefore the full scope of the claims is not enabled.

Applicant's arguments to the enablement rejection of the previous office action are addressed, to the extent that they apply to the instant claims, below.

1. That the limitation of variations to 1 to 5 amino acids is a very small variation and that it is within the skill of the art to determine variant proteins which will maintain the required functions. Applicant argues that, as bacteria are simpler than eukaryotic organisms, the examiner's arguments regarding post-translational modification and the effects of amino acid alteration within a protein are not entirely applicable. Applicant suggests that, because bacteria are simple, less experimentation is required to determine protein activity.

2. That the examiner's arguments regarding the extremely large number of possible variants encompassed by the claims do not apply. Applicant suggests that the skilled artisan would not need to make and test each of these variants and that one could use their knowledge of conservative substitutions to increase the chance for retention of activity.

Applicant's arguments have been fully considered and deemed non-persuasive.

Regarding argument 1, the claims are not limited to a single change of 1 to 5 amino acids. Applicant's amendment changed the terms deletion, substitution, insertion, and addition to the

plural forms of the words, clearly indicating that the claims include proteins with multiple changes of 1 to 5. The number of proteins this encompasses is phenomenally large and virtually incalculable. Dependent claim 33 is drawn to proteins encoded by polynucleotides that hybridize with sequences complementary to SEQ ID NO:3 and 5. Specific hybridization conditions are given; but, the claims "comprise" those conditions, which means that the claims encompass any hybridization conditions. However, even if one accepts the conditions listed, applicant's, in the specification, state that "stringent conditions" include conditions where the DNA would have homology of at least 70%. The polypeptide of SEQ ID NO:4 is 245 amino acids long. A polypeptide with 70% homology to SEQ ID NO:4 would have changes in 73 amino acids. Even if these changes were limited to the first 73 amino acids in the polypeptide, there would be more than $9x10^{94}$ claimed polypeptides. When one considers that any amino acids, in any combination, along the length of the entire polypeptide, the number of polypeptides encompassed by the claims is far higher than $9x10^{94}$ and is practically incalculable. As stated previously, it is within the skill of the art to make and test these possible polypeptides; however, applicant has provided no guidance whatsoever regarding which amino acids could be changed, deleted, or added to achieve or maintain the claimed function. Merely enumerating the possible polypeptides would be undue experimentation. Considering the laboratory processes required to generate and test bacterial mutants, making and testing an incalculable number of variants certainly constitutes undue experimentation. Moreover, the fact that bacteria are simpler organisms may make them easier to work with than eukaryotes, but this in no way decreases the number of variants that are encompassed by the claims, and the amount of experimentation required would still be extremely large. Further, applicant's suggestion that post-translational modifications are not a factor in bacteria is incorrect. It is well known that bacteria modify proteins after translation. Correctly folded proteins are a requirement for activity in all organisms. Also, it is incorrect to suggest that single amino acid changes do not alter protein function in bacteria. Point mutations can alter protein function regardless of the simplicity of the organism.

Regarding argument 2, there is no mention in the claims of conservative substitutions. All deletions, substitutions, insertions, and additions are encompassed by the claims. And in fact, there is no such thing as a "conservative" deletion, insertion, or addition. Additionally,

applicant appears to be suggesting that one could use their skill to determine which changes could be made while maintaining the required function. There is no guidance whatsoever in the specification regarding which changes could be made and applicant has not actually disclosed what activity the claimed proteins have. With no knowledge of the claimed proteins, other than the sequence, there is no guidance regarding what changes should be made. Finally, as stated previously, changing even a single amino acid (even conservative substitutions) can alter the activity of the protein, even in bacteria.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 3, 32, and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is rendered vague and indefinite by the phrase "increasing the activity of a protein." Applicant has claimed a bacterium that has increased expression of protein A or B and "increasing the activity" of protein C or D. It is not clear how a bacteria can have "increasing the activity." Furthermore, the activity of the protein with the amino acid sequence of SEQ ID NO:6 has unknown activity. Therefore, it is not clear how one would know if activity was increased.

Claim 1 is rendered vague and indefinite by the phrase "wherein the expression of said protein is increased by transforming said bacterium with the gene coding for said protein." Based on the structure of the sentence and on the use of semicolons and commas, it appears that the cited clause refers to proteins C and D. Therefore, there is no means provided in the claim for increasing the expression of proteins A or D. Moreover, the claim requires increased activity of proteins C or D, but the cited clause refers to an increase of expression, not an increase in activity.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Gangle whose telephone number is (571) 272-1181. The examiner can normally be reached on M-F 7-3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Siew can be reached on (571) 272-0787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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